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Econometrics for experimental economics

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ABSTRACT

In tradition, experimental economics uses non-parametric statistics to compare means between groups of attendants who attend experiments with different settings to investigate the effect of anticipated mechanism or policy. This statistical analysis limits itself to the effectiveness of the interventions without explanation why attendants response to the mechanism or policy in such the ways. Econometrics especially the panel data analysis can extend the analysis by adding explanatory variables into models with the panel data set constructed from the experiments in order to explain why the attendants behave as being observed. This paper introduces the idea and guideline how to use panel data analysis in experimental economics.

Keywords: Experimental economics, non-parametric statistics, panel data analysis

JEL Classification: C51, C23, C70

1. Experimental economics

Experimental economics is an alternative way to collect data for economic research. Apart of survey and time series, an experiment aims to get a data set on issues that are difficult or impossible to find in reality (Royal Swedish Academy of Science, 2002; Chaudhuri, 2009; Chakarvaty et al, 2011). For example, people don't act or show cheating behavior, selfishness or strategic moves in a common field survey. These behaviors do not appear in time series data too. The only way to collect these data is to observe through experiments conducted in laboratories that guarantee total privacy to attendants.

There are several subjects that link to experimental economics. The subject is linked to behavioral economics (Altman, 2012). Combination of behavioral economics and experimental economics constructs a set of experiment that observes behavior of people, especially the transactions and responses of a player to another player's decision. This leads to the linkage between experimental economics and game theory too. The subject also link to psychology (Ariley and Norton, 2007) where the theories in psychology are foundations for economic analysis in an experiment (Fehr and Falk, 2002).

Experimental economics is growing among scholars around the world. More than 100 standard laboratories operate to conduct the experiments including Chiang Mai Laboratory of Experimental Economics in Faculty of Economics, Chiang Mai University which follows the suit and standard of Goettingen Laboratory of Behavioral Economics of Professor Claudia Keser at Faculty of Economic Sciences, University of Goettingen, Germany.

Nowadays, more and more works in this field of experimental economics constantly appear in academic journals. The methods can be applied to many area of economics such as development economics (Banerjee and Duflo, n.d.), social and economic network analysis (Jackson, 2008), social capital (Karlan, 2005) financial decision (Karlan, 2005), team building (Kiatkarun and Suriya, 2013), Innovation and imitation (Rattanasut and Suriya, 2013), Illegal behavior (Songchoo and Suriya, 2012) and labor market (Cohn, Fehr and Goette 2013). Experimental economics seems to become more important in the economic science in the future due to its uniqueness in its way of economic data collection (Binmore and Shaked, 2010).

2. Non-parametric statistics in experimental economics

In statistical analysis of the data from the experiments, economists use non-parametric analysis. The reason is because of the limited observations. In doing an experiment, all attendants must have the payment in real cash (Friedman and Sunder, 1994; Isacc, Walker and Williams, 2000; Chaudhuri, 2009) . The money acts as the attending fee and incentives to attract attendants to make rational decision in the experiment. The compensation must be attractive enough to bring people to be attendants. Therefore, an experiment spends a lot of money in order to operate.

The least number of observations is eight according to the limitation of the non-parametric statistics. Below this number, the statistics will lack of reliability. Then, most of experiments prefer to have around eight until twelve pairs of players. This is 16 to 24 attendants in an experiment. It must add two times of this number due to the comparison between different settings which are at least two. Therefore, the least number of attendants is 32 persons composing 16 pairs of player, 8 in the first setting and another 8 in the second setting. After that, non-parametric statistics will perform the comparison of the means. Examples of the non-parametric statics are Wilcoxon-Mann-Whitney test for unmatched data (comparison of the means from different group of people), Wilcoxon-signed-ranks test, Spearman rank correlation coefficient, sign test and binomial test for matched data (comparison of the means from the same group of people but in different settings).

3. Panel data analysis in experimental economics

According to the only 16 pairs of observation, t-test cannot work well with this limited number of observations. The t-test needs more than 30 observations to ensure that the distribution satisfies the t-distribution. Therefore, t-test is not valid for the statistical analysis in experimental economics.

Another way to solve this problem is to use panel data analysis which is a branch of econometrics. An experiment usually makes players to play more than 1 round, normally 10 – 20 rounds. Therefore, a researcher will observe a series of decisions of a person 20 times. This is a time-series part of the panel data. Moreover, there are at least 8 players in an experiment who play as player "A" and at least 8 players as player "B". This is the cross-section part of the panel data. Pooling both time-series and cross-section parts, a researcher can construct a set of panel data which consists of at least 80 observations (8 persons$\times$ 10 rounds) for player "A" and another 80 observations for player "B".

Traditional fixed effects model and random effects model together with Hausman test for the selection of a better model can perform good analysis of this panel data (Suriya, 2010). Many works show that the results from panel data analysis supports the results of non-parametric statistics very well (Songchoo and Suriya, 2012; Kiatkarun and Suriya, 2013; Rattanasut and Suriya, 2013) In some cases, the results of this econometric analysis also yield more information than non-parametric analysis such that it does not only compare the means between two settings of the experiment but also explain why a player behaves like it appears in the experiment.

4. Conclusions

This paper presents the applications of econometrics in experimental economics through several examples such as illegal logging game, product imitation game and academic competitive game. Traditionally, experimental economics uses non-parametric statistics for the analysis because of the small numbers of observation. With panel data analysis, econometrics extends the numbers of observation and the analysis of experimental economics. Critical points that will make the econometric analysis meaningful rely on the modeling and variable selection.

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